IN THE DRAWINGS

Please replace drawings sheets 2 and 5 with the Replacement Sheets thereof accompanying this paper (see Attachment B, which includes a complete set of drawings including the Replacement Sheets). Annotated drawings showing the changes (in red ink) made to the original drawings are attached hereto as Attachment A.

The corrections and/or amendments are as follows:

Fig. 2

The junction of the wire connected to resistor 216 and the wire connected to capacitor 212 has been clarified by addition of a enlarged dot indicating that the branches are connected.

Fig. 5

The junction of the wire connected to motor 406 and the wire connected to capacitor 418 has been clarified by addition of a enlarged dot indicating that the branches are connected.

REMARKS

Amendments to the Drawings

The drawings have been amended slightly to clarify and/or correct two small features.

First, in Figure 2, the junction of the wire connected to resistor 216 and the wire connected to capacitor 212 has been clarified by addition of an enlarged dot to more clearly indicate that the branches are connected. Second, in Figure 5, the junction of the wire connected to motor 406 and the wire connected to capacitor 418 has been clarified by addition of an enlarged dot to more clearly indicate that the branches are connected.

Support for the amendment to Figure 2 appears, for example, in paragraph 0036, which indicates that "current sense resistor 216 and amplifier 218 ... provide feedback to circuit 220 of output current." It is respectfully submitted that one skilled in the art would readily understand that a circuit path is needed from current sense resistor 216 to amplifier 218 for such operation to occur, and would readily understand from inspection that the branches identified above would be interconnected in order to make such a circuit path.

Support for the amendment to Figure 5 appears, for example, in paragraph 0058, which indicates that "[c]apacitors 418 and 420 filter the output to remove ripple from the output voltage." It is respectfully submitted that one skilled in the art would readily understand that a circuit path is needed from voltage output to capacitor 418 for such operation to occur, and would readily understand from

inspection that the branches identified above would be interconnected in order to make such a circuit path. While such connection is understood in original Figure 5, the addition of the enlarged dot merely confirms such a connection.

It is respectfully submitted that the foregoing amendments are fully supported by the original application as filed, and that no new matter has been added thereby.

Claim Rejections

Claims 1-9 presently stand rejected under 35 USC § 103(a) as allegedly unpatentable over Brockle et al. (U.S. Patent No. 6,826,059), in combination of Kawakami (U.S. Patent. No. 4,618,812) and Shirai (U.S. Patent. No. 5,598,068). This rejection is respectfully traversed.

Claims 1 and 6 are independent, and will be addressed first. The dependent claims will be addressed thereafter.

Claim 1 is directed to a battery-operated LED lighting apparatus having a battery, at least one light emitting diode, and a power supply including a boost regulating circuit, that provides a "constant voltage" to at least one light emitting diode. Bockle '059, on the other hand, is just the opposite – it provides an ***alternating*** voltage (in the form of a PWM signal) to the light emitting diode(s). While arguably unnecessary, claim 1 has been amended to clarify that the power supply is in communication with the battery and the at least one light emitting diode "such that a ***constant*** voltage is ***continuously*** supplied to said at least one light emitting diode as said battery discharges, wherein over at least a portion of

said discharge cycle said constant voltage is higher than said battery voltage." Bockle '059 does not disclose or suggest such an apparatus. The PWM signal of Bockle '059 would provide a rapidly time varying voltage, not a "constant" voltage that is "continuously supplied" as set forth in claim 1.

The other reference cited against claim 1 – Kawakami '812 – is also inapposite. Kawakami '812 discloses a power control circuit using PWM control signals for DC to DC conversion, but nowhere does Kawakami '812 teach using a "constant voltage" to supply power to at least one LED. Attempting to substitute Kawakami's power supply in Bockle's device, as suggested by the Office Action, would not change the fact that Bockle '059 uses an alternating (PWM) voltage to control the LED(s) – an inherently inconsistent approach with Kawakami '812. This is further confirmed by the fact that the preferred PWM frequency for Bockle '059 is above 200 KHz, and the switching frequency is chosen to correspond to the "resonance frequency of the load circuit" in order to achieve "as high a luminosity as possible" (col. 4, lines 59-66), while the "switching frequency can be altered to control the brightness" of the LED. (Col. 2, lines 10-14) Thus, using PWM is fundamental to Bockle '059, and to the extent that Kawakami '812 is cited for the proposition that a "constant voltage is continuously supplied" to at least one LED, as set forth in claim 1, such a combination would be directly contrary to Bockle's teachings. It is therefore respectfully submitted that a combination of Bockle '059 and Kawakami '812 is inappropriate, and that claim 1 should be allowable thereover.

Independent claim 6, as amended, is directed to a battery operated LED lighting apparatus similarly having at least one light emitting diode (LED) and a power supply including a boost regulating circuit, wherein the power supply produces an output voltage to the at least one light emitting diode such that a "***constant*** direct current is ***continuously*** supplied" to the at least one LED as the battery discharges, "wherein over at least a portion of said discharge cycle said output voltage is higher than said battery voltage." Similar to the remarks made in regard to claim 1, Bockle '059 does not provide a "constant direct current" that is "continuously supplied" to at least one LED as a "battery discharges," as claimed. Again, it would be inappropriate to attempt to combine Bockle's device using a PWM output signal with Kawakami '812, which outputs a DC voltage and has no teaching in relation to LEDs nor how to integrate with a device such as disclosed in Bockle '059. Thus, claim 6 should be allowable over the two cited patents.

Claims 2-5 and 7-9 depend from claims 1 and 6, respectively, and should be allowable as depending from an allowable base claim. Moreover, the dependent claims contain additional novel and patentably distinct features as well.

For example, claim 2 recites that the lighting apparatus comprises a "plurality of light emitting diodes segregated into groups, said groups connected in parallel," wherein the light emitting diodes in each group "are connected in series." Claim 7 is similar. Bockle '059, in contrast, is configured such that is has "two ***antiparallel***-connected light-emitting diode (LED) arrays D1 and D2"

(col. 4, lines 34-36), and therefore teaches just the opposite of having LEDs segregated into groups which are "connected in ***parallel***" as recited in claims 2 and 7. Thus, it is respectfully submitted that the configuration disclosed in Shirai '068 is inapplicable to Bockle '059, and that claims 2 and 7 should be allowable.

Claim 3 depends from claim 2, and recites that "each group" further includes "a ballasting element connected in series with said plurality of light emitting diodes connected in series." Claim 4 recites that the ballasting element comprises a "resistor." Among other things, it is unclear how Shirai's identical current sources would be arranged with Bockle's "antiparallel-connected" LED arrays D1 and D2, and thus at a minimum a significant amount of experimentation would be needed to determine how to combine Bockle's and Shirai's different LED configurations including Shirai's current sources, assuming that they may be combined at all (which is also not clearly established).

Claim 5 recites, among other things, that the power supply further comprises a "buck regulator," and that "over a portion of said discharge cycle said battery voltage is greater than said constant voltage and said buck regulator is operative to regulate said battery voltage at said constant voltage." Claim 9 also recites a buck regulator, but unlike claim 5 specifies that the buck regulator is operative to regulate the battery voltage at the constant voltage "to produce a constant current" through the light emitting diode. While the Examiner cites to Kawakami's Fig. 1 for these alleged teachings, Bockle's PWM output voltage, as previously noted, is incompatible with the DC output voltage provided by

Kawakami '812; moreover, there is no teaching that the combination would produce a "constant current" as set forth in claim 9. In fact, the portion of Bockle '059 cited in the Office Action (i.e., col. 2, lines 40-45) contrasts Bockle's PWM approach with constant current devices said to be in the prior art. (As stated in Bockle '059: "A further advantage of the circuit arrangement according to the invention over the constant-current sources used hitherto is that ... only very low switching losses and conducting-state power losses occur in the inverter...."). Thus, it is respectfully submitted that the cited patents do not render the subject matter of claims 5 or 9 obvious.

Claim 8 is similar to claim 3, but further recites that "each ballasting element having a value selected such that the level of direct current drawn by each group is substantially identical." An example of this configuration, and certain advantages thereof, is taught as follows in the instant application, at paragraphs 37 and 41:

> "In addition, each column [of LEDs] includes ballasting resister [sic] 306a -t to reduce the effects of slight voltage variations from LED-to-LED and insure the electrical current will be properly shared between individual columns. Such ballasting improves the consistency of brightness between individual LED lamps. * * *
>
> [P]arallel combinations of LED lamps do not inherently load share well. Typically the lamp, or string of lamps, with the lowest forward voltage will hog the current provided for the entire array of lamps resulting in a group of LED lamps with varying brightness

throughout the group. This problem can be alleviated, at least to some degree by providing the LED array with a voltage greater than the required forward voltage for the grouping, and providing a ballasting device in series with each series combination of LED lamps."

Shirai '068, by contrast, does not tailor a resistor value for each group of LEDs; instead, each resistor 412-462 and 414-464 has the same value of 47 Ohms. (*See* Shirai '068 at col. 4, lines 3-10) Thus, Shirai '068 fails to disclose or suggest the recitals of claim 8.

It is therefore respectfully submitted that claims 2-5 and 7-9 should be independently and individually allowable over the three cited patents, regardless of the other novel features set forth claims 1 and 6.

New Claims

New claims 10-38 have been added. Of these, claims 10 and 31 are independent. New claims 11-30 depend from claim 10, and new claims 32-38 depend from claim 31.

New independent claim 10 is directed to an LED lighting apparatus that includes a "light emitting diode," and a "switch-mode regulator circuit having an input and a first output, said first output in communication with said light emitting diode such that when said input receives a first voltage, said first output provides a constant output to said light emitting diode." It is respectfully submitted that, among other things, claim 10 is patentably distinct from the cited

patents because of the fact that the switch-mode regulator circuit provides a "constant output" to the light emitting diode, in contrast to the techniques taught by the cited patents.

New independent claim 31 is directed to a "battery-powered lighting apparatus" that includes a "plurality of light emitting diodes," and a "switch-mode regulator circuit configured to receive a first input voltage derived from a battery" and "having a first output in communication with said light emitting diode to provide a continuous voltage output to the light emitting diodes." It is respectfully submitted that, among other things, claim 31 is patentably distinct from the cited patents because of the fact that the switch-mode regulator circuit receives a first input voltage "derived from a battery" and provides a "continuous voltage output" to the light emitting diode, in contrast to the techniques employed in the cited patents.

New dependent claims 11-30 and 32-38 also contain additional distinct and novel features.

Support for the new claims is found throughout the specification and drawings of the original application. New claim 28, in particular, is supported at least in part by paragraph 35 ("Generally, converter 100 is powered by a battery, i.e., battery 108, but may also be powered by a power supply, for example a wall plug-in type supply").

Reservation of Right to Challenge Cited Items

While Applicants have elected to respond to the Office Action by making various amendments and/or arguments as set forth herein, this should not be construed as an admission that the cited items constitute prior art or otherwise provide an enabling disclosure. Applicants reserve the right to challenge the sufficiency of any of the cited items as prior art at a later point in time, including in any post-issuance proceeding or suit, if appropriate.

Request for Allowance

In view of the above, it is submitted that the current application stands in condition for final allowance. Early and favorable action is, therefore, earnestly solicited.

Respectfully submitted,

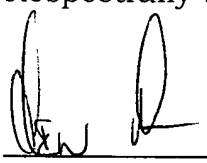

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Fig.2

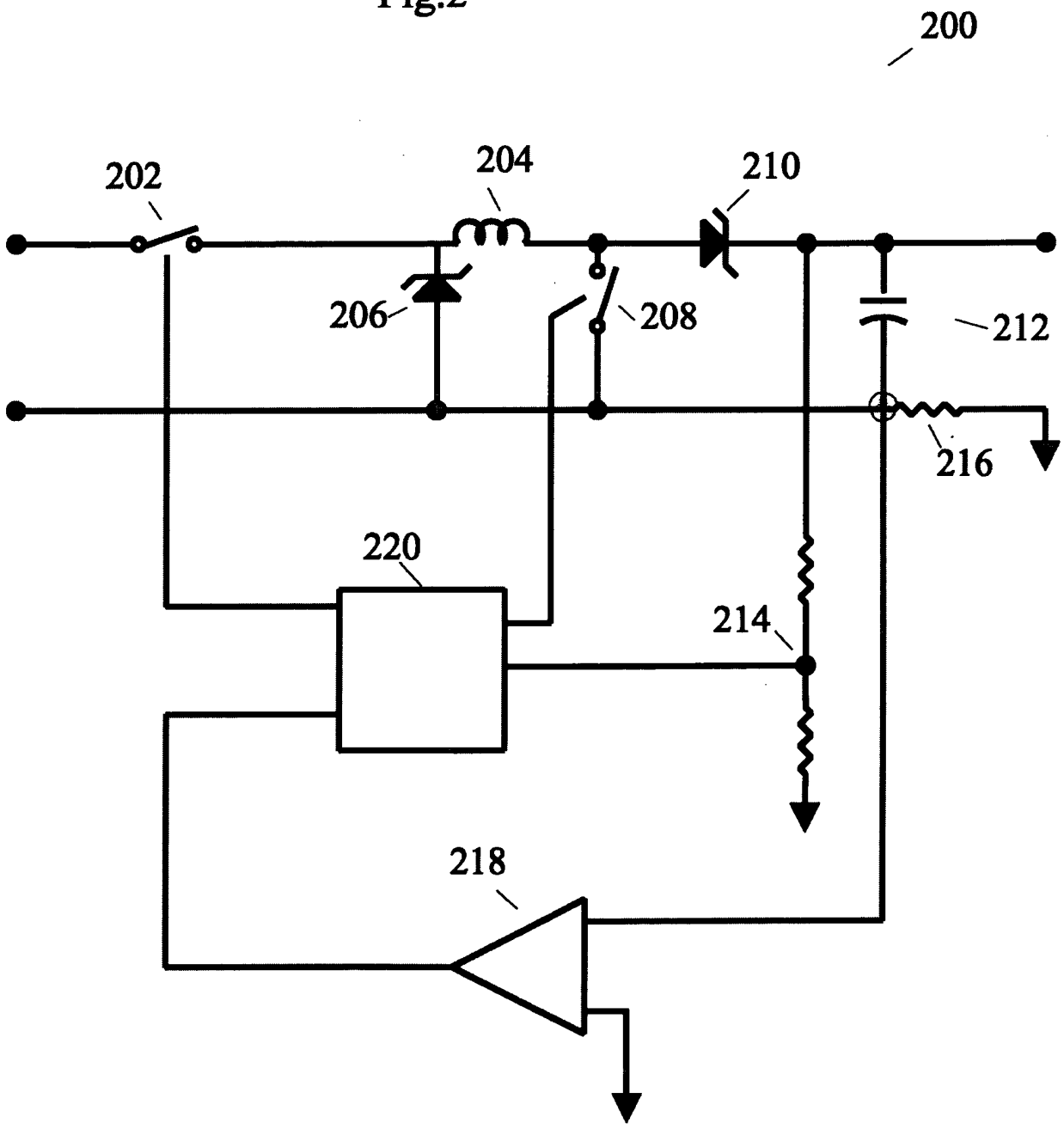

Fig.5